would offer an easy explanation, but no general confirmation of the existence of such tissue has been forthcoming.

No definite conclusions can be drawn from a study of my specimens, but the striking regularity of the arrangement of the cells often in long rows and at times parallel to the nerve fibers speaks in favor of their origin from some pre-existing lymphatic structure.

Whatever may be the answers to these questions that I have asked in a purely suggestive way; whatever may be the pathogenesis of these orbital masses or the relation to each other of the several diseases just mentioned, the clinical fact of the occasional occurrence of exophthalmos in leukemia, pseudoleukemia, chloroma, and Mikulicz's disease should be kept in mind by both oculist and internist.

TYPHOID AND PARATYPHOID SPONDYLITIS, WITH BONY CHANGES IN THE VERTEBRÆ.[1]

By Thomas McCrae, M.D., M.R.C.P.,
ASSOCIATE PROFESSOR OF MEDICINE AND CLINICAL THERAPEUTICS, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

(From the Medical Clinic of the Johns Hopkins Hospital.)

The usual features of typhoid spine are well recognized, and there is no intention to discuss them in detail in this paper, but the proof of definite bony changes in the vertebræ seems worthy of note, especially as in one of the instances here reported these followed infection with a paratyphoid bacillus.

Case I. *Typhoid fever in January followed by the symptoms of typhoid spine; a typhoid relapse in July; definite bony change in the spine; recovery.*

The patient was a white male, aged twenty-eight years, a lawyer, admitted to the Johns Hopkins Hospital on July 4, 1904, complaining of a stiff and painful spine. The family history was negative.

Previous History. He had always been very strong and athletic. He had the ordinary diseases of childhood: chicken-pox, measles, whooping-cough, and one attack of malarial fever some years before. There was no history of gonorrhœa or lues. He had used alcohol very moderately.

Present Illness. On January 2, 1904, he went to bed with an attack of typhoid fever of moderate severity. He was convalescent early in March, when one night he awakened suddenly with very severe pain in the back, and found that he had to lie flat and quiet in bed, as any attempt to rise caused acute pain in the lumbar region. Since then his spine has been stiff. He was able to get up in a chair in the latter part of March and began to walk in the beginning of April. During this time his back was stiff, but not especially painful, except on movement of the lower spine. He gradually improved in general health, but the local condition grew steadily worse, and any exercise gave him a great deal of pain. At the time of admission there was almost constant pain in the lower back and down the thighs.

---

[1] Read at the meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906

On admission the temperature and pulse were normal. The patient was very neurotic and quite unstrung, complaining bitterly of any movement, so that it was difficult to make a thorough examination. He was well nourished and his color was good. There was marked dermatographia at this time, and subsequently. The lungs and heart were clear. The abdomen was natural, but there was definite resistance on palpation, the muscles being held very stiffly. The spleen was not felt There was no disturbance of the joints of the arms or legs. The spine was held almost perfectly straight and there was practically no curve in the lumbar region. There was no tenderness on pressure over the sacrum or the sciatic notch. When the patient had to sit up he pulled himself up by his hands and kept the spine as stiff as possible. He had great difficulty in standing and kept his hands on his thighs, the attitude being very characteristic. It was difficult to test any movements of the spine as he could not be induced to bend forward or backward, but lateral movements to the right seemed less than to the left. Stooping was done with a stiff spine, and on standing up the patient "climbed up his legs." The Widal reaction was well marked on the day after admission.

In the two or three days after admission the patient suffered a great deal, was very restless, and cried out frequently with pain. At times he would complain of severe spasms in the muscles of the back. He was given 4 milligrams of tuberculin, but there was no reaction. On July 9, a jacket was put on, but this seemed to make the condition worse, and large doses of sedatives did not seem to have any effect on the pain. On July 10, the temperature, normal since admission, rose to 102°, and the patient seemed dull and drowsy. The pain became more severe and there was marked rigidity of the muscles of the back. The knee-jerks could not be obtained. The blood count showed, red cells 4,220,000; leukocytes, 5000; and hemoglobin, 70 per cent. The fever continued, although rather irregular, varying from normal to 104° between July 10, and 16, On July 15, rose spots were noted, but the spleen could not be felt. After July 16, the temperature became more regularly elevated, between 103° and 104° for some days, and fever continued for a total of eighteen days. The patient became dull and drowsy, the tongue was furred and the lips dry. The lungs and heart were clear throughout. The patient usually lay with the knees drawn up, and there were frequent spasmodic movements of the abdominal muscles. The area of splenic dulness was increased, but the spleen was not felt, any palpation being difficult on account of the condition of the abdominal walls. There was slight prominence of the spinous process of the second, third, and fourth lumbar vertebræ, on each side of which there was some fulness. Over these areas the patient constantly complained of pain. The lumbar muscles were very rigid. There was no superficial redness or fluctuation. By July 18, the ninth day of fever, the patient was rather more comfortable, the severe pain having left, and being replaced by a dull ache. The tongue was still coated. The abdomen was softer; there were some rose spots, and the splenic dulness was still increased. The leukocytes were 10,400. On July 22 the patient was very dull and apathetic, making no complaint of pain, and there was much less tenderness in the lumbar regions. There was still some fulness noted to the left of the lumbar spine. By July 29, the temperature was normal, and the patient looked as if he had been through a long illness. The movements of the upper spine seemed freer, and there was little complaint of pain. Percussion over the spine did not cause pain, and spasm of the back muscles was much less marked. There was still slight fulness to the left of the third and fourth lumbar vertebræ. By August 15 the patient could sit up in bed. He soon got about on crutches, but had difficulty in walking. He improved rapidly and was discharged on September 8. There was no local deformity or tenderness. The patient would not make the attempt to bend forward or back, but there was slight lateral movement. When the patient stooped he did it by "climbing down his thighs" with the spine held rigidly, and flexion at the hip and knee.

A blood culture during the time of fever was negative. The urine varied from 1006 to 1022 in specific gravity, showed a trace of albumin on several occasions, but no casts were found; it gave a positive diazo reaction after the onset of fever.

The radiogram, taken by Dr. Baetjer on July 5, showed on the right side, between the second and third lumbar vertebræ, a definite deposit of bone filling in the intervertebral space. This was apparently deposited in the lateral ligament, and formed a bony union between the two vertebræ. The process was localized to this one area, and the spine elsewhere was normal.

The patient made a rapid recovery and was able to return to work within three months. Since then he has been in very good health, does not have any pain, and is able to play tennis, and jump and vault as well as he ever could. There is some stiffness in the lower back, which is only noticed after remaining in a bent position for some time. When he gets up after bending over, there seems to be contraction in the muscles of the back in the lumbar region, and this takes a few moments to relax completely. He cannot bend over with quite the same ease as he did before, but otherwise he considers himself perfectly well.

An interesting point in this history is the interpretation of the period of fever, six months after the beginning of the original attack, and four months after the onset of the symptoms of typhoid spine. It might be considered merely as the fever which accompanies the typhoid bone lesions in some instances, but its duration of nineteen days, the general appearance of the patient, the rose spots, increased splenic dulness, and positive diazo reaction, all seem to suggest either a relapse or a second attack. The blood culture was negative, and the Widal reaction was positive before the onset of fever We decided to regard it as a relapse.

CASE II. *Typhoid fever (paratyphoid infection); mild attack; onset of the symptoms of typhoid spine on the thirty-seventh day; definite bony changes found in the spine; recovery.*

The patient was a colored male, aged twenty-eight years, a laborer, admitted to the Johns Hopkins Hospital on October 23, 1905, complaining of chills and pains over the body.

The family history was negative. There was no history of tuberculosis.

Previous History. He had the ordinary diseases of childhood, but there was no history of typhoid or rheumatic fever, pneumonia, or pleurisy. He had apparently had several attacks of malarial fever. Two years previously he had a primary sore and gave a definite history of secondaries. He had gonorrhœa twice, the last time being about six months before admission. He had drunk very little alcohol, and had always been a hard worker.

Present Illness. This began on October 23, 1905, with a chill, fever, and vomiting. The fever continued, and he had headache and backache. There had been repeated shaking chills. There had been some cough and loss of appetite, but no nose-bleed.

Examination. On admission the temperature was 104°, and the patient looked ill. There was no delirium. The tongue was coated. The lungs were clear on percussion, but there were a few rales on auscultation. The heart was of normal size, and the sounds were clear. The abdomen was natural, the edge of the liver was just felt, but the spleen was not palpable. No rose spots were made out. The blood count showed red cells, 5,096,000; leukocytes, 11,000; and hemoglobin, 95 per cent.

Two days later the patient complained of abdominal pain, and the leukocytes had fallen to 6000. On November 1 the edge of the spleen was just felt and the area of dulness was increased. Some rather suspicious rose spots were noted. The bronchitis continued. There was no special change in the next ten days, the patient going through a course like that of a mild attack of typhoid fever. The temperature became normal on November 14, the twenty-third day. All the blood counts had been practically normal. On November 28, after two weeks of normal temperature, it was noted that the patient had great pain when he sat up, and that the back was held rigidly. He was up out of bed and felt well, but complained of severe pain in the spine. On December 9, the forty-eighth day of the disease, he still complained of severe pain in the back, but nothing definite could be made out over the spine, and there was then no local tenderness. The condition varied greatly, some days the patient being free from pain, and again crying and moaning constantly. He soon became very neurotic and showed hyperesthesia of the skin with increase of the reflexes.

The radiogram taken by Dr. Baetjer, on December 9, showed a definite deposit of new bone on both sides between the fourth and fifth lumbar vertebræ. The intervertebral region seemed entirely filled on both sides of the spine. The deposit of bone seemed to involve both the intervertebral disk and the lateral ligaments.

About December 12, the fifty-first day, he began to have slight fever, the temperature usually rising to 100°, and occasionally to 101°; this continued off and on for about five weeks. At this time he was in a very nervous state, refused to make any effort to stir or sit up himself, and wept at the suggestion of movement by anyone else. When helped up it was found that the spine was held straight and seemed stiff. No local changes could be made out, although there was slight tenderness over the lumbar region and sacroiliac joint. During the next two weeks the patient complained of a great deal of pain, especially over the sacrum and iliac crests, but tenderness on pressure was always very variable. The movements at the hip were perfectly free, but with the thigh flexed on the body the leg could not be extended at the knee. The knee-jerks were very active. During this time he was steadily gaining in weight. On December 23 it was noted that there seemed to be more atrophy relatively in the legs than in the arms. The lumbar curve was almost obliterated, and there was marked muscle spasm on both sides of the spine. There was no pain on touching the skin or on pressure, except over the sacroiliac joint. The rigidity continued, but by January 10 the patient could sit up in bed. By January 25 he was able to stand with some support, but the back was held stiffly, and the patient could not be made to bend the spine. The radiogram taken on January 30 showed the same condition between the fourth and fifth lumbar vertebræ as before, but in addition the intervertebral space between the third and fourth lumbar vertebræ on the right side was slightly encroached upon by a bony deposit, which suggested that the process was extending. On January 31 it was noted that there was a double scoliosis, with the convexity to the right in the scapular region and to the left in the dorsolumbar region. The upper thoracic spine could be moved well, but there was limitation below, with more lateral movement to the right than to the left. All attempts to move the spine caused pain. There was no definite area of tenderness to the left between the fourth and fifth lumbar vertebræ. There was no involvement of any other joints. There was some pain on pressure over the sciatic nerve.

On February 9 it was noted that there was very little movement in the spine, and the patient's legs were so weak that he had difficulty in standing, and no trial could be made of his attitude in touching the floor. There was almost a convexity in the lumbar region. The muscles of the right leg showed marked atrophy, the measurements being much less than those of the left leg. The knee-jerks were increased on both sides, but especially on the left. After this a plaster jacket was applied, and the patient began to walk about. The only pain was occasionally at night, when he discarded the jacket. He improved rapidly, gained weight, and the movements of the spine, except in the lumbar region, improved rapidly. He was discharged on March 16, in very good condition. The blood count throughout showed no special features. The urine showed a specific gravity, which varied from 1007 to 1030. Albumin was present during the first ten days, with hyaline and granular casts, but was afterward clear. The diazo reaction was not obtained at any time. Gonococci could not be found in scrapings from the urethra. The blood pressure during the fever varied from 95 to 115 mm. Hg.

The Widal reaction was negative on the sixth, ninth, and thirteenth days, and on six subsequent occasions. Blood cultures, taken by Dr. Howard on the ninth and fifteenth days, both gave a paratyphoid bacillus. This was agglutinated in the fourth generation by the patient's serum. Typhoid serum did not agglutinate the bacillus obtained from the patient's blood. The patient's serum did not agglutinate several other paratyphoid organisms. Cultures from the urine and stools were negative for paratyphoid and typhoid bacilli. The patient's serum agglutinated the organism from the first and the second cultures in dilutions from 1 to 20 to 1 to 1000.

The patient was seen on May 1, 1906. He looked very well, had done heavy laboring work without any trouble, and stated that, except for slight stiffness in the lower back, he was free of all effects of his illness.

The attack was rather a mild one, and the patient had no severe symptoms. As in the first patient, the neurotic features were very marked. The patient would whine and cry without being able to give any reason, and at times when he stated that there was no severe pain. Another striking feature was the rapidity of improvement after it once began.

The frequency of typhoid spine is difficult to estimate, but the number of instances reported in the last few years suggests that the condition must have often been overlooked previously. The reported cases have recently been reviewed by Fluss,[1] who collected forty-six from the literature. The condition usually appears during convalescence and has been in males in about three quarters of the cases. Trauma seemed to have been a factor in a small number. In the majority the attack of typhoid fever was mild. There has been much difference of opinion as to the cause of the symptoms, but there can be little doubt of definite organic changes in at least some of the cases. Even in those without any definite evidence of local trouble, the suspicion of some process, apart from a neurosis, may well be entertained.

It is of interest to discuss the more prominent symptoms, in view of the changes found in the two instances here reported.

1. *Pain.* This is usually the principal symptom, is often referred to the lower dorsal or lumbar region, and may radiate around the body or down the legs. It is generally aggravated by any movement, either active or passive, and may be so severe that the patient implores those coming near not to touch him. In some it has been necessary to give chloroform. There is much variation in the site of pain, its production by pressure, and its presence from day to day. In one of the instances here reported the patient at times was entirely free from pain. Fluss found pain on pressure over the vertebra in 19, with rigidity in 14, and radiation in 14 among the series of 46 cases. Some had pain on pressure over the sacro-iliac joint. The character of the pain varies greatly, there are often severe paroxysms which may last for hours, and these may alternate with periods in which the pain is described as a dull ache. The pain may radiate along the intercostal nerves, around the abdomen to the gentials or down the legs. Some patients obtain the greatest relief by lying prone. Curiously enough, the pain is not easily influenced by drugs, and large doses of sedatives, even morphine, may have but little effect. This has been commented on by several writers and was especially marked in Case I.

As regards the explanation of the pain, while in some cases it may be a neurosis, yet to associate it with local changes in and about the spine seems most reasonable, certainly in many of the cases. It may be due to pressure from inflammatory processes, the deposits of new bone, or communicated inflammation. The other evidences of involvement of the nerves, such as the disturbances of sensation, altered reflexes, wasting, etc., must be remembered.

2. *Neurotic Features.* These are present in many of the cases and may be most marked. They may come on with surprising rapidity, so that soon after the onset of symptoms the patient becomes hysterical, loses all control over his inhibition, and is transformed into a whining, complaining individual with whom it is difficult to have any patience. A similar state is often found in

---

[1] Centralb. f. d. Grenzg. d. Med. u. Chir., 1905, viii, No. 17 et seq.

spondylitis associated with other diseases, such as arthritis deformans, in which the patient loses all control over himself and shows the same lack of effect from sedatives. Any kind of pain has a demoralizing effect on the morale, but this seems to be especially marked in that due to such spinal conditions. After an attack of typhoid fever one can understand that a patient may be exhausted and have less resistance to the effect of pain, but this will not serve as an explanation for the same result in the other disease.

3. *Spinal or Nerve Disturbances.* In addition to pain there may be alteration of sensation, either paresthesia or anesthesia, as in eight of the cases collected by Fluss. Pain on pressure over the muscles and nerves has been noted. The reflexes may be altered, increased, diminished, or absent. They may vary from time to time and be more increased on one side than the other, as in Case II. Muscle spasms and rhythmical movements have been observed. Muscular atrophy may be marked and be more pronounced in one leg than in the other. Disturbances of the function of the bladder and rectum, both retention and incontinence, have been noted in a few instances. Kernig's sign has been noted in two cases in the literature and was present in the second reported here. Ankle clonus has been noted in three instances. While some of these conditions might be due to functional disturbance, yet the majority suggest organic change somewhere. This is especially suggestive when, as in Case II, the muscular wasting is most marked on the side which showed the most involvement in the radiogram.

4. *Muscles.* Weakness, atrophy, and muscle spasm have been the most marked signs. There may be paresis of the leg muscles, so that the patient regains very slowly the power of walking, or there may be difficulty in standing. These conditions were marked in the cases here reported. The atrophy may be partly responsible for this. Both these patients had great difficulty in stooping or rising, and they kept the hands on the thighs to aid and steady themselves. The atrophy may be more marked on one side than the other. Muscle spasm is usually most marked in the muscles of the back, which may be held constantly rigid or become so on any movement. Associated with this there may be marked spasms occurring during sleep.

Swelling of the soft parts was noted in three, and local redness and heat in two, of the forty-six cases collected by Fluss. Œdema of the lumbosacral region has been observed. In another case, reported by Neisser,[1] disturbance of sensation and swelling occurred in the right lumbar region in the second week after the symptoms of typhoid spine appeared. An incision was made under local anesthesia, and a portion of muscle removed showed marked degeneration, with diminution of the nuclei, in part destruction of the sarcolemma, and vacuole formation. Five weeks later there was much the same condition on the left side. On incision, œdema was found, with inflammation and degeneration in the muscle. These muscle changes can hardly be regarded as due to neuritis, and were explained as being due probably to contiguity.

---

[1] Deut. Aerzte-Zeitung, 1900, Heft 23.

5. *Spine.* The conditions here vary from tenderness on pressure to the presence of deformity and deposit of new bone. *Tenderness* has been noted in about half of the cases and is usually most marked in the lower dorsal, lumbar, and sacral regions. It may be elicited by direct pressure or by pressing against the head or the feet. Rigidity is a common finding, and in the light of the present report may be due in some cases to definite bony deposits. This, however, is thus far only proved to occur in the lower spine and as the whole spine may be held rigidly, muscular fixation must play a large part. The attitude on any attempt to move or rise is characteristic, as also when the patients stoop or try to walk. *Scoliosis* was found by Fluss in five out of forty-six cases. It may be only temporary, as in the case reported by Neisser, referred to before, in which the scoliosis is described as like that of the "neurotic or neuralgic" type. Neisser regarded it as being due to the inflammation and contraction of the vertebral muscles. Scoliosis was noted in Case II. *Kyphosis* occurred in fourteen of the forty-six cases. It is usually lumbar or dorsal, in one case being cervical. It is remarkable that in most of these the deformity disappeared after a time. In some instances there has been pain on pressure over the sacro-iliac joint and rarely swelling.

6. *Bone Deposits.* The most important change is the deposit of new bone, as shown in the two instances reported here. The exact seat of this change is difficult to state. In the first it filled in the intervertebral space between the second and third lumbar vertebræ, apparently being deposited in the lateral ligament and forming bony union between the two vertebræ. In the second the process extended from the second to the fifth vertebræ and appeared to involve both the lateral ligaments and part of the intervertebral disks. So far as has been found these are the first reported instances of definite changes being found by radiograms. Cutler[1] reported a case with negative findings.

7. *Fever.* This has been noted in about half of the reported cases. It is usually somewhat irregular. In a few instances it has been accompanied by chills. There was fever in both our cases, in one regarded as occurring with a relapse, but in the other persisting for about five weeks in an irregular fashion. It is evident that when fever is present its occurrence must be regarded as evidence of an organic process.

[1] Boston Med. and Surg. Jour., 1901, cxlvi, No. 26.

8. *Leukocytes.* No special attention appears to have been paid to them and no marked increase has been noted. They rose to 10,400 in the first case, but were normal in the second during the period of symptoms from the spinal complication.

9. *Duration.* This has varied from two weeks to some months, and it has been two years before a patient has recovered his previous working ability. The duration in the first of our patients may be regarded as about six months until discharge from the hospital and nine until complete recovery. In the second it was about four months. The remarkable rapidity of improvement, when this has begun, is to be noted. As a rule, the patients are free from the acute symptoms in a very short time.

When an explanation of typhoid spine is sought we are compelled to advance suppositions instead of certainty, in the absence of any pathological examination. There seems little doubt, however, that it must be regarded as due to the local action of the bacillus. During an attack of typhoid fever the bacilli are present in the bones, and, as a rule, do not set up local changes until the latter part of the course or during convalescence. Why this should be is difficult of explanation. It seems most reasonable to suppose that the changes set up in the spine are due to the action of the bacilli there. As to why the lower part of the spine should be involved so frequently, no good explanation is advanced. The process may affect various structures—thus it may be osteitis, osteomyelitis, chondritis, perichondritis, periostitis, or a combination of these, and secondarily other structures may be involved. There may be both a spondylitis and a perispondylitis. As Gibney suggested in 1889, it may be an acute inflammation of the periosteum and the fibrous structures which hold the spine together. Arthritis of the vertebral joints is a possibility, but arthritis of any joint is very rare in typhoid fever.

With such local changes the explanation of the symptoms is easy. The possible influence of trauma is evident. The involvement of the bony structures accounts for the signs in the spine itself, the tenderness, muscular rigidity, and occasional deformity. The deposit of new bone or ossification of cartilage is like that seen in other conditions. When it is remembered that exostoses may appear elsewhere following the typhoid bone lesions, for example on the tibia, as in the case reported by Tapie,[1] it does not seem strange that this should occur in the spine. With an inflammatory periostitis new bone formation is not uncommon. In some instances the process probably extends to the adjoining structures, which explains the local swelling sometimes found, the œdema and muscle changes described by Neisser. The involvement of the nerve roots would seem to be an invariable sequence, either by pressure or contiguity. In some it may be possible that there may be some degree of pachymeningitis, which is suggested by Kernig's sign being occasionally present, as in Case II.

---

[1] Arch. prov. de Med., 1900, ii, 145.

In view of all these evidences of an organic lesion it seems reasonable to conclude that in certain of the cases at any rate there are definite changes either in the vertebræ or adjacent structures. That these cannot always be demonstrated as definite bony changes is evident. The process may not extend so far. But as in the majority of pathological conditions there are grades of severity, why not in this? There are comparable instances in the acute attacks of arthritis deformans, in which with acute arthritis in the joints of the extremities there may be evidence of involvement of the vertebræ which leave no permanent change, so far as we can discover. This may be seen either in the cervical or lumbar regions. So that while the milder attacks of typhoid spine may not prove to be associated with a definite process in the vertebræ, yet as severe attacks have been, the probability of all being in the same class seems worthy of consideration. One question difficult of explanation must arise, namely, the reason why such typhoid bone lesions of the vertebræ do not go on to pus formation, as is so common in the bones elsewhere. To this no answer can be given, for there seems no reason why they should not. It is dangerous to predict, but if the view here expressed be correct, an example of pus formation in the vertebræ will probably yet be found. It must be remembered that typhoid bone lesions of the ribs which have gone on to swelling and fluctuation may subside without external discharge of pus.

"Typhoid Spine" Associated with a Paratyphoid Infection. It will be noted that a paratyphoid infection has been here considered as typhoid fever. At present it seems to me more reasonable to consider typhoid fever as a disease which may be caused by several of the typhoid-colon group of bacilli than to make separate headings for each variety of bacillus.

Relation of Infections to Spondylitis. The proof that following typhoid fever, due to infection with the typhoid or a paratyphoid bacillus, there may be a spondylitis, opens up a suggestive question as to the etiology of spondylitis in general. The condition here described does not differ from that found in arthritis deformans—especially the type sometimes spoken of as the osteoarthritic. As to the cause of this we are yet uncertain, but that it is due to an infection seems most probable. Is this infective agent a specific organism, or may the same result be caused by various organisms? Such cases as here reported appear to support the latter view.

The list of infections which may be followed by changes in the vertebræ is a long one: scarlet fever, measles, influenza, gonorrhœa, septicemia, pyemia, phlegmon, pneumonia, and even a pustular acne have been reported. Certain other diseases, such as purpura and scurvy, have been added. As to the reports of the condition following acute rheumatic fever one questions if some of them may not have been instances of acute arthritis deformans, wrongly diagnosed. As to the exact process in these we cannot decide as yet, but the possibility of a multiple causal agency opens up a fruitful line for further work.

Reference has already been made to the similarity in the clinical features between the cases of typhoid spondylitis and those associated with arthritis deformans. The essential conditions seem to be the same and the pressure sign also. From radiograms it would be impossible to distinguish one from the other.

CONCLUSIONS. 1. In certain instances of typhoid spondylitis there are definite bony changes in the vertebræ.

2. The general features of the condition suggest the probability of organic changes in the spine of some degree being a usual occurrence.

3. The similarity of the changes found in typhoid spondylitis and those in the spondylitis found in other infections, especially arthritis deformans, suggest that the latter may be due to various infective agents.

THE VALUE OF THE DIFFERENTIAL LEUKOCYTE COUNT IN DIAGNOSIS.[1]

By FREDERIC E. SONDERN, M.D.,
PROFESSOR OF CLINICAL PATHOLOGY IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL.

A STUDY of the results obtained from complete blood examinations in some 8000 cases in private practice in the course of a number of years, rather than theoretical reasoning, led to the conviction that the differential leukocyte count is a factor of prime importance in the diagnosis and prognosis of most inflammatory lesions, and that with a knowledge of its details, the degree of leukocytosis has a significance not appreciated otherwise.

In February of last year, in a paper read before the Surgical Section of the New York Academy of Medicine, I reviewed data from some 1400 surgical cases, which seemed to justify conclusions briefly as follows: The increase in the relative number of polynuclear cells is an indication of the severity of the toxic absorption, and the degree of leukocytosis is an evidence of the body resistance toward the infection. Furthermore, it was found that within reasonable limits the figures obtained would justify an inference as to

---

[1] Read at the meeting of the American Association of Pathologists and Bacteriologists, Baltimore, May 18, 1906.